The ballot for James Joseph Sylvester, Esq., was postponed in consequence of the number of Fellows required by the charter not being present.

The following papers were read, viz.—

"On the Constitution of the Resins." *Part I.* By James F. W. Johnston, Esq., F.R.S.

The object of the general investigation, of which the commencement is given in this paper, is to determine the relative composition of the various resins which occur in nature, and to trace the analogies they exhibit in their constitution; and also to ascertain how far they may be regarded as being derived from one common principle, and whether they admit of being all represented by one or more general formulæ.

The chemical investigation of the resin of mastic shows that this substance consists of two resins; the one soluble, and acid; the other insoluble, and having no acid properties. The formulæ expressing the analysis of each of these are given by the author. He also shows that a series of analyses may be obtained which do not indicate the true constitution of a resin. The soluble resin, when exposed to the prolonged action of a heat exceeding 300° Fahr. is partly converted into a resin containing three, and partly into one containing five equivalent parts of oxygen, the proportion of carbon remaining constant. The same resin combines with bases, so as to form four series of salts; which, in the case of oxide of lead, consist of equivalents of resin and of oxide in the proportions, respectively, of two to one; three to two; one to one; and one to two. This soluble resin in combining with bases does not part with any of its oxygen; but if any change takes place in its constitution, it consists in the hydrogen being replaced by an equivalent proportion of a metal; and formulæ are given representing the salts of lead on this theoretical view. By boiling the resin in contact with ammonia and nitrate of silver, or perhaps with nitrate of ammonia, it is converted into a resin which forms a bisalt with oxide of silver, in which there is also an apparent replacement of hydrogen by silver.

The resin next examined is that of dragon's blood: and the conclusions deduced from its analysis are the following. First, that the lump dragon's blood is the natural and pure resin, while the strained and red varieties, being manufactured articles, are more or less decomposed: secondly, that this resin retains alcohol and ether, as most other resins do, with considerable tenacity; but that these solvents may be entirely expelled by a long-continued exposure to a temperature not higher than 200° Fahr.: and lastly, the formulæ representing its chemical composition is given.

"Researches in Embryology." — *Second Series.* By Martin Barry, M.D., F.R.S.E., Fellow of the Royal College of Physicians in Edinburgh. Communicated by P. M. Roget, M.D. Sec. R.S.

The author having, in the first series of these researches, investigated the formation of the mammiferous ovum, describes in this second series its incipient developement. The knowledge at present

supposed to be possessed of the early stages in the developement of that ovum, consists chiefly of inferences from observations made on the ovum of the bird.

But there exists a period in the history of the ovum of the mammal, regarding which we have hitherto scarcely any direct or positive knowledge. It appeared, therefore, highly desirable to obtain a series of observations in continuous succession on the earliest stages of developement. In conducting this investigation, the author purposely confined his attention to a single species, namely, the rabbit, of which he examined more than a hundred individual animals. Besides ova met with in the ovary, apparently impregnated, and destined to be discharged from that organ, he has seen upwards of three hundred ova in the Fallopian tube and uterus; very few of the latter exceeding half a line in their diameter. The results of these investigations have compelled the author to express his dissent from some of the leading doctrines of embryology, which at present prevail, as respects not only the class Mammalia, but the animal kingdom at large. The following are the principal facts which the author has observed in the developement of the mammiferous ovum.

The difference between the mature and immature ovum consists in the condition of the yelk; the yelk of the mature ovum containing no oil-like globules. Both maceration and incipient absorption produce changes in the unimpregnated ovum, which in some respects resemble those referable to impregnation. During the rut, the number of Graafian vesicles appearing to become prepared for discharging their ova, exceeds the number of those which actually discharge them. Ova of the rabbit which are destined to be developed, are in most instances discharged from the ovary in the course of nine or ten hours *post coitum*; and they are all discharged about the same time.

There is no condition of the ovum uniform in all respects which can be pointed out as the particular state in which it is discharged from the ovary; but its condition is in several respects very different from that of the mature ovum *ante coitum*. Among the changes occurring in the ovum before it leaves the ovary, are the following: viz. the germinal spot, previously on the inner surface, passes to the centre of the germinal vesicle; the germinal vesicle, previously at the surface, returns to the centre of the yelk; and the membrane investing the yelk, previously extremely thin, suddenly thickens. Such changes render it highly probable that the ovary is the usual seat of impregnation. The author considers this view as being not incompatible with the doctrine that contact between the seminal fluid and the ovum is essential to impregnation, since he has found, in the course of his researches, that spermatozoa penetrate as far as to the surface of the ovary. The retinacula and tunica granulosa are the parts acted upon by the *vis a tergo*, which expels the ovum from the ovary. These parts are discharged with the ovum, render its escape gradual, probably facilitate its passage into the Fallopian tube, and appear to be the bearers of fluid for the immediate imbibition of the ovum. After the discharge of the ovum from the ovary, the ovisac is obtainable free from the vascular covering, which, together

with the ovisac, had constituted the Graafian vesicle. It is the vascular covering of the ovisac which becomes the corpus luteum. Many ova, both mature and immature, disappear at this time by absorption. In some animals minute ovisacs are found in the infundibulum, the discharge of which from the ovary appears referable to the rupture of large Graafian vesicles, in the parietes or neighbourhood of which those ovisacs had been situated.

The diameter of the rabbit's ovum, when it leaves the ovary, does not generally exceed the 135th part of an inch, and in some instances it is still smaller. The ovum enters the uterus in a state very different from that in which it leaves the ovary; hence the opinion, that "in their passage through the tube the ova of Mammalia undergo scarcely any metamorphosis at all," is erroneous. Among the changes taking place in the ovum during its passage through the Fallopian tube are the following; viz. 1. An outer membrane, the chorion, becomes visible. 2. The membrane originally investing the yelk, which had suddenly thickened, disappears by liquefaction; so that the yelk is now immediately surrounded by the thick transparent membrane of the ovarian ovum. 3. In the centre of the yelk, that is, in the situation to which the germinal vesicle returned before the ovum left the ovary, there arise several very large and exceedingly transparent vesicles: these disappear, and are succeeded by a smaller and more numerous set; several sets thus successively come into view, the vesicles of each succeeding set being smaller than the last, until a mulberry-like structure has been produced, which occupies the centre of the ovum. Each of the vesicles of which the surface of the mulberry-like structure is composed contains a pellucid nucleus; and each nucleus presents a nucleolus.

In the uterus a layer of vesicles of the same kind as those of the last and smallest set here mentioned makes its appearance on the whole of the inner surface of the membrane which now invests the yelk. The mulberry-like structure then passes from the centre of the yelk to a certain part of that layer, (the vesicles of the latter coalescing with those of the former where the two sets are in contact to form a membrane,) and the interior of the mulberry-like structure is now seen to be occupied by a large vesicle containing a fluid and granules. In the centre of this vesicle is a spherical body having a granulous appearance, and containing a cavity apparently filled with a colourless and pellucid fluid. This hollow spherical body seems to be the true germ. The vesicle containing it disappears, and in its place is seen an elliptical depression filled with a pellucid fluid. In the centre of this depression is the germ, still presenting the appearance of a hollow sphere. The germ separates into a central and a peripheral portion, the central portion occupies the situation of the future brain, and soon presents a pointed process which is the rudiment of the spinal cord. These parts at first appearing granulous are subsequently found to consist of vesicles.

Thus the central portion of the nervous system is not originally a fluid contained within a tube, but developes itself in a solid

form before any other part. The central portion of the nervous system sometimes attains a considerable degree of developement, although it be exceedingly minute; thus an instance has been met with in which the developement of this part had reached a stage scarcely inferior to that in another instance, in which the corresponding part measured more than ten times the length.

There does not occur in the mammiferous ovum any such phenomenon as the "splitting" of a membrane into the so-called "serous, vascular, and mucous laminæ." Rathke had already found that parts previously supposed by Baer and others to be formed by the so-called "germinal membrane," really originate independently of it: these parts are the ribs, pelvic bones, and the muscles of the thorax and abdomen, which according to Rathke arise in a part proceeding out of the "primitive trace" itself. Reichert had previously discovered that the part originating the lower jaw and hyoid bone "grows out of the primitive trace." The author beginning with an earlier period goes farther than these observers, and shows that the so-called "primitive trace" itself does not arise in the substance of a membrane, but presents a comparatively advanced stage of the object above described as the true germ. Hence the author suggests, there is no structure entitled to be denominated the "germinal membrane."

The most important of the foregoing facts respecting the developement of the mammiferous ovum, however opposed they may be to received opinions, are in accordance with, and may even explain, many observations which have been made on the developement of other animals as recorded in the delineations of preceding observers. If in the ovum of the bird the germinal vesicle in like manner returns to the centre of the yelk, the canal and cavity known to exist in the yelk of that ovum might be thus explained. The ovum may pass through at least one-and-twenty stages of developement, and contain, besides the embryo, four membranes, one of which has two laminæ, before it has itself attained the diameter of half a line, a fifth membrane having disappeared by liquefaction within the ovum.

The size of the minute ovum in the Fallopian tube and uterus affords no criterion of the degree of its developement; nor do any two parts of the minute ovum, in their developement, necessarily keep pace with one another.

The proportion of ova met with in these researches, which seemed to be abortive, has amounted to nearly one in eight. Sometimes two yelk-balls exist in the same ovum. With slight pressure, the ovum, originally globular, becomes elliptical. Its tendency to assume the latter form exists especially in the chorion, and seems to be in proportion to its size.

The author has discovered that when the germinal vesicle is first seen it is closely invested by an extremely delicate membrane. This membrane subsequently expanding is that in which the yelk is formed. He has traced the chorion from stage to stage up to the period when it becomes villous, and shows that it is not, as he formerly supposed, the thick transparent membrane itself of the ovarian

ovum, but a thin envelope closely investing that membrane, and not appreciable as a distinct structure until the ovum has been crushed. When the chorion first admits of demonstration as a distinct structure the ovum consists of three membranes, a state which the author has seen in an ovum no farther advanced than about an inch into the Fallopian tube. The chorion subsequently thickens and imbibes a quantity of fluid presenting a gelatinous appearance.

April 25, 1839.

The MARQUIS of NORTHAMPTON, President, in the Chair.

Robert Rigg, Esq. and James Joseph Sylvester, Esq. were balloted for, and duly elected into the Society.

A paper was in part read, entitled, "Account of Experiments on Iron-built Ships, instituted for the purpose of discovering a Correction for the Deviation of the Compass produced by the Iron of Ships." By George Biddell Airy, Esq., M.A., F.R.S., A.R.

May 2, 1839.

The MARQUIS of NORTHAMPTON, President, in the Chair.

Arthur Farre, M.B., was balloted for, and duly elected into the Society.

A paper was in part read, entitled, "On the Motion of the Blood." By James Carson, M.D., F.R.S.

May 9, 1839.

The MARQUIS of NORTHAMPTON, President, in the Chair.

William Sharpey, M.D. and the Rev. Charles Turnor, M.A. were balloted for, and duly elected into the Society.

The reading of a paper, entitled, "On the Motion of the Blood." By James Carson, M.D., F.R.S., was resumed and concluded.

After referring to his paper contained in the Philosophical Transactions for 1820, relative to the influence of the elasticity of the lungs as a power contributing to the effectual expansion of the heart, and promoting the motion of the blood in the veins, the author states that his object in this paper is to explain more fully the mode in which these effects are produced, and to corroborate by additional